

# ***Health Consultation***

## ***Exposure Investigation Work Plan***

### **Indoor Air Quality**

**Philip Services Corporation - Georgetown Neighborhood  
Seattle, King County, Washington**

June 15, 2001

#### **Prepared by**

Washington State Department of Health  
Under a Cooperative Agreement with the  
Agency for Toxic Substances and Disease Registry



## **Intro duction**

Contaminated groundwater has migrated from the Philip Services Corporation's (Philip Services) facility located at 734 South Lucile Street into the Georgetown neighborhood of Seattle, King County, Washington (Figure 1). The Washington State Department of Health (DOH) is conducting an exposure investigation to evaluate whether people who live and/or work above the groundwater contaminant plume are being exposed to harmful levels of chemicals volatilizing from the groundwater.

## **Background**

The Philip Services' Georgetown facility is a permitted treatment and storage facility for industrial and household hazardous waste. It is located in a mixed residential, commercial, and industrial area. Leaking underground storage tanks and other releases that occurred at the Philip Services' facility in the past appear to be the source of contaminants detected in groundwater migrating from the site. The tanks were reportedly removed in 1987. A soil vapor extraction system was installed at the facility in the mid-1990s to reduce the concentration of volatile organic compounds (VOCs) in the soil. The concentration of VOCs remaining in the soil is unknown.

Groundwater in the vicinity of the Philip Services facility is found in three aquifers - shallow, intermediate, and deep. VOCs such as vinyl chloride, benzene, chloroform, trichloroethylene (TCE), and tetrachloroethylene (PCE) have been found in the groundwater.<sup>1, 2, 3, 4</sup> Figure 2 shows the approximate lateral extent of groundwater contamination. Although the chemicals detected in the three aquifers are of concern when evaluating all pathways and routes of exposure, only the VOCs detected in the shallow aquifer are of concern for the indoor air exposure investigation because they can readily move from the shallow aquifer into the unsaturated zone and travel into indoor air where they can be inhaled by building occupants.

Depth to shallow groundwater at the Philip Services facility varies from season to season. The highest groundwater levels generally occur in the winter months when the aquifer is being recharged by precipitation. Shallow groundwater generally reaches its lowest level in the late summer or early fall.<sup>5</sup> Groundwater elevation maps generated from data collected in the shallow aquifer at and in the vicinity of the Philip Services facility in January and October 2000, are shown on Figures 3 and 4, respectively. Based on this data, groundwater in the shallow aquifer appears to flow west to southwest away from the Philip Services facility toward some of the Georgetown residences and businesses.

## **Exposure Pathways**

VOCs in groundwater can migrate into the overlying soil and discharge into indoor and outdoor air where people can inhale these contaminants. Because considerable dilution occurs when the groundwater contaminants discharge into outdoor air, it is unlikely that people are being exposed to harmful levels of VOCs. As a result, the groundwater to outdoor air pathway is not considered a significant exposure pathway and will not be sampled as part of this exposure investigation. People's potential exposure to these same contaminants in indoor air, however, is considered a significant exposure pathway particularly in buildings with basements because these structures are closest to the groundwater table where the highest concentrations of VOCs are typically found in the unsaturated zone.

## **Exposure Investigation Objectives**

The objective of the exposure investigation is to determine whether people living and/or working above the groundwater contaminant plume are being exposed through the inhalation pathway to harmful levels of VOCs migrating from the groundwater through the unsaturated zone into indoor air. Two sampling events were selected to evaluate whether there are seasonal differences in VOC concentrations in the buildings.

## **Exposure Investigation Tasks**

The first round of indoor air samples was collected by DOH in August 2000. Although the August sampling event corresponded with the time of year when the groundwater table elevation is low, it did occur when little rainfall typically falls in the Seattle area. VOCs can more readily migrate through the unsaturated zone when the soil pores do not contain significant amounts of infiltrating rainwater.

The second indoor air sampling round was conducted in March 2001, which corresponds to the time of year when the greatest rainfall typically occurs and the groundwater table elevation is high. Because infiltrating rainwater can reduce or prevent the migration of the VOCs through the unsaturated zone, the second indoor air sampling round was scheduled during a period when little or no rainfall was occurring.

Both sampling rounds were conducted in coordination with background air, soil gas, and groundwater monitoring conducted by Philip Services near the homes and businesses sampled by DOH. The background air, soil gas, and groundwater data collected by Philip Services will be evaluated by DOH during the exposure investigation. DOH will also evaluate regional air quality data collected by the Puget Sound Clean Air Agency (PSCAA) and the Washington State Department of Ecology (Ecology).

DOH consulted with the U.S. Environmental Protection Agency (EPA) during the selection of the indoor air sampling locations. The sampling locations were selected based on groundwater and soil gas contaminant concentrations as well as community member concerns about exposure to contaminants in indoor air at their homes.

DOH, in consultation with EPA and the Agency for Toxic Substances and Disease Registry (ATSDR), developed the sampling and analysis plan (Appendix A). DOH contacted property owners by telephone or in person, in advance of the sampling, to obtain access to the various properties. The air samples were collected by DOH using air sampling equipment supplied by DataChem Laboratories, a Utah-based analytical laboratory. DataChem analyzed all the air samples collected by DOH. EPA will validate the analytical data.

DOH will evaluate the analytical results obtained during the exposure investigation along with the data collected by Philip Services, PSCAA, and Ecology to determine whether the contaminated groundwater poses a threat to human health through the indoor air pathway. An exposure investigation report will be prepared by DOH, in cooperation with ATSDR, summarizing the results of the evaluation. Recommendations for exposure reduction will be included in the exposure investigation report, if necessary.

## **References**

1. Technical Memorandum for the Preliminary Results of the Supplemental Off-Site Groundwater Characterization, Philip Services Georgetown Facility, Philip Services Corporation, October 24, 2000.
2. Technical Memorandum II for the Results of the Supplemental Off-Site Groundwater Characterization, Philip Services Georgetown Facility, Philip Services Corporation, November 30, 2000.
3. Technical Memorandum III for the Results of the Supplemental Off-Site Groundwater Characterization, Philip Services Georgetown Facility, Philip Services Corporation, December 2000.
4. Technical Memorandum IV for the Results of the Supplemental Off-Site Groundwater Characterization, Philip Services Georgetown Facility, Philip Services Corporation, January 2001.
5. Groundwater Elevations, Annual 2000, Georgetown Facility, Philip Services Corporation, February 13, 2001.
6. Approximate Extent of Groundwater Contamination, Draft Figure, Philip Services Corporation, Undated.

## **Appendix A**

### **Sampling and Analysis Plan Round Two - Indoor Air Sampling**

## **Sampling and Analysis Plan Round Two - Indoor Air Sampling**

**Philip Services Corporation - Georgetown Neighborhood  
Seattle, King County, Washington  
March 20, 2001**

The sampling and analysis plan provides detailed guidance for sampling and other data gathering methods to be used during the indoor air sampling.

### **Site Background**

Shallow groundwater located at and downgradient of the Philip Services' Georgetown facility contains volatile organic compounds (VOCs) that appear to have been released from the facility. These groundwater contaminants may be diffusing into the overlying unsaturated zone and migrating into indoor air in homes and businesses.

### **Sampling Objectives**

The objective of the second round of indoor air sampling is to obtain 24-hour indoor air samples at homes and businesses located above the shallow groundwater plume. These results will be used by DOH to evaluate whether people who live and/or work above the plume are being exposed through the inhalation pathway to harmful levels of VOCs.

### **Sample Location and Frequency**

Indoor air samples were collected from five residences and two businesses. The sampling locations are summarized in Table 1 and shown on Figure 5.

The indoor air samples were collected using SilicoCan™ 6-L, stainless steel canisters with a passive flow regulator. The canisters were evacuated to a pressure that, in conjunction with the pre-set flow regulator, draws for 24-hours. The canister intake was set at a height that corresponds to the general breathing zone within the room sampled. For example, the cannister intake was set at pillow height near a bedroom. Air samples collected in living rooms were set at a height that corresponds to the height of an average person while sitting.

### **Quality Control Sample**

Two samplers were set up, side by side, at one sampling location to collect duplicate samples. The duplicate sample will be used to verify the consistency of the sampling procedures.

**Table 1**  
**Indoor Air Sample Locations**

<u>Sample Number</u>	<u>Sample Location</u>	<u>Duplicate</u>
PS-IA0672-0301A	Basement Apartment	
PS-IA0672-0301B	Basement Apartment	X
PS-IA0710-0301	Business Office	
PS-IA5409-0301L	Basement	
PS-IA5409-0301U	1 <sup>st</sup> Floor	
PS-IA0303-0301	Basement	
PS-IA0134-0301	1 <sup>st</sup> Floor	
PS-IA0412-0301	Business Basement	
PS-IA0125-0301U	1 <sup>st</sup> Floor	
PS-IA0125-0301L	Crawl Space	



## **Sample Designation**

The sample designations were pre-assigned for each indoor air sample as shown on Table 1.

## **Sampling Equipment and Procedures**

Indoor air samples were collected using SilicoCan™ 6-L, stainless steel canisters with a passive flow regulator. The canisters were evacuated to a pressure that, in conjunction with the pre-set flow regulator, drew for 24-hours. Sampling instructions, provided by DataChem Laboratories, are included in Attachment 2.

None of the indoor air sampling equipment required field decontamination.

## **Sample Analysis**

Samples were analyzed for VOCs by DataChem Laboratories of Salt Lake City, Utah, using EPA Method TO15 with select ion mode (SIM). Because the linear range for the SIM mode is 0.05 to 2.0 ppbv, sample parameters (i.e., chemicals) with concentrations that exceed 2.0 ppbv were further analyzed using EPA Method TO15 to quantify chemical concentrations above 2.0 ppbv.

## **Documentation**

Photographs were taken at each sample location. Details about the indoor air sampling including sample location descriptions, sample identification numbers, sample times, weather conditions including indoor and outdoor temperature and barometric pressure, and other relevant information was recorded in a field log.

A chain-of-custody form was prepared for each container sent to the laboratory. The chain-of-custody form contained the sample identification number, sample date, and required analytical method. Copies of the chain-of-custody form were retained for DOH's records.

## **Data Quality Assessment**

The laboratory analytical data generated during the exposure investigation will undergo validation by EPA Region 10 to ensure that it is useable for meeting the project objectives.

## **Schedule**

The second round of indoor air sampling was conducted on March 22, 2001, and terminated on March 23, 2001.

## **Project Organization and Responsibility**

DOH, in cooperation with ATSDR, is the lead for the exposure investigation. DOH staff conducted the indoor air sampling. Data Chem Laboratories analyzed the samples. EPA will conduct data validation. DOH, in cooperation with ATSDR, will review and evaluate the data and prepare the exposure investigation report.

Barbara Trejo	Washington Dept. of Health 7171 Cleanwater Lane Building 3 Tumwater, WA 98501	(360) 236-3373 E-mail: <a href="mailto:Barbara.Trejo@doh.wa.gov">Barbara.Trejo@doh.wa.gov</a>
Paul Pope	Data Chem Laboratories 60 S. LeVoy Drive Salt Lake City, UT 84123	(800) 356-9135 (801) 268-9992 E-mail: <a href="mailto:pope@datachem.com">pope@datachem.com</a>
Ed Jones	EPA	(206) 553-1079
Marcia Bailey	EPA	(206) 553-0684

**Attachment 1**

**Consent for Access to Property at:**

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I hereby consent to employees of the Washington State Department of Health (DOH) and parties authorized by DOH to access to the property indicated above for the collection of ambient air samples.

I realize that DOH is working in conjunction with the Agency for Toxic Substances and Disease Registry (ATSDR) and that these agencies are acting under mandates provided under state and federal law.

I am the property owner, or an individual having the authority or the authorization of the property owner to make this access agreement.

This written permission is given by me voluntarily with full knowledge of my right to refuse and without threats or promises of any kind.

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Print Name

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Signature

Date

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## **Attachment 2**

### **Indoor Air Sampling Instructions DataChem Laboratories**

## **Certification**

This Health Consultation was prepared by the Washington State Department of Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was begun.

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**Debra Gable**  
**Technical Project Officer, SPS, SSAB, DHAC**  
**ATSDR**

The Division of Health Assessment and Consultation, ATSDR, has reviewed this public health consultation and concurs with the findings.

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**Richard Gillig**  
**Chief, SPS, SSAB, DHAC**  
**ATSDR**